

*Hazardous Substances Emergency Events Surveillance Program*

# **Hazardous Substance Emergency Events in Washington State, 1998-2001**

For more information or additional copies of this document, contact:

Hazardous Substances Emergency Events Surveillance Program  
Office of Environmental Health and Safety  
Washington State Department of Health  
Building 4, New Market Industrial Campus  
PO Box 47825  
Olympia, WA 98504-7825

Phone: (360) 236-3387  
FAX: (360) 236-2261

Secretary of Health  
Mary Selecky



DECEMBER 2002

## CONTENTS

EXECUTIVE SUMMARY .....	4
INTRODUCTION .....	5
METHODS .....	5
RESULTS .....	6
SUBSTANCES .....	7
VICTIMS .....	7
EVACUATION .....	9
CONTINGENCY PLANS .....	9
METHAMPHETAMINE PRODUCTION .....	9
USES OF HSEES DATA .....	10
SUMMARY OF RESULTS, 1993–2001 .....	11
APPENDICES .....	12

## APPENDICES

<a href="#"><u>Appendix A - The 10 Most Frequently Released Substances</u></a> , 1998 – 2001.....	11
<a href="#"><u>Table 1.— HSEES events, by year and type of event</u></a> , 1998 – 2001.....	12
<a href="#"><u>Table 2.— HSEES events, by county and type of event</u></a> , 1998 – 2001.....	15
<a href="#"><u>Table 3.— Substances released, by type of event</u></a> , 1998– 2001.....	16
<a href="#"><u>Table 4.— Substances released, by substance category and type of event</u></a> , 1998 – 2001.....	16
<a href="#"><u>Table 5.— Distribution of victims, by type of event</u></a> , 1998 – 2001.....	17
<a href="#"><u>Table 6.— Substance categories in all events and events with victims</u></a> , 1998 – 2001.....	18
<a href="#"><u>Table 7.— Adverse health effects, by type of event</u></a> , 1998 – 2001.....	22
<a href="#"><u>Table 8.— Cumulative data</u></a> , 1998 – 2001.....	22
<a href="#"><u>Figure 1. —Areas of fixed facilities involved in events</u></a> , 1998 – 2001.....	12
<a href="#"><u>Figure 2. —Transportation-related events, by type of transport</u></a> , 1998 – 2001.....	13
<a href="#"><u>Figure 3. —Factors contributing to fixed-facility events</u></a> , 1998 – 2001.....	14
<a href="#"><u>Figure 4. —Victims by population group and type of event</u></a> , 1998 – 2001.....	17
<a href="#"><u>Figure 5. —Responder victims, by population group and type of event</u></a> , 1998 – 2001.....	19
<a href="#"><u>Figure 6. —Distribution of type of injury for all events</u></a> , 1998 – 2001.....	20
<a href="#"><u>Figure 7. —Injury outcome</u></a> , 1998 – 2001.....	21
<a href="#"><u>Figure 8.— Distribution of victims</u></a> , 1998 – 2001.....	23
<a href="#"><u>Figure 9.—Cumulative data</u></a> , 1993 – 2001.....	23



## EXECUTIVE SUMMARY

Since 1990, the Agency for Toxic Substances and Disease Registry (ATSDR) has maintained an active, state-based Hazardous Substances Emergency Events Surveillance (HSEES) system to describe the public health consequences associated with the release of hazardous substances. Since 1991, the Washington State Department of Health has participated in this surveillance system. This report summarizes the characteristics of events reported to the surveillance system by the Washington State Department of Health during 1998-2001.

Information on acute hazardous substances emergency events was collected. The types of data collected included general information on the event, substance(s) released, number of victims, number and types of adverse health effects experienced by the victims, and number of evacuations.

Several data sources were used to obtain the maximum amount of information about each event. These sources included, but were not limited to, Federal Department of Transportation, Washington State Department of Ecology, Washington State Emergency Management, Washington State Department of Labor and Industries, Washington State Patrol, local fire departments, and local news media. Prior to January 2000, the data obtained were computerized using an ATSDR-provided data entry system and were sent to ATSDR quarterly. Beginning in January 2000, data were entered into a Web-based data entry system that allows for real-time data entry.

The Washington State Department of Health reported a total of 1780 events for 1998-2001; approximately 1302 (73%) of the events occurred at fixed facilities, and 478 (27%) were transportation related. Equipment failure was the most common contributing factor of the releases [620 (35%)]. In 1616 (91%) of the events, only a single substance was released. The most commonly reported categories of substances were other substances (24%), other inorganic substances (19%), volatile organic compounds (14%), acids (11%), and ammonia (9%). During this reporting period, 616 events (approximately 35% of all reported events) resulted in a total of 1653 victims. The adverse health effects most frequently experienced by victims were respiratory irritation, eye irritation, dizziness and other central nervous system symptoms, gastrointestinal problems and headache. A total of 28 persons died as a result of all events, and 356 (20%) events required evacuations.

The findings regarding the distribution of the types of events, the numbers of events with victims and evacuations, and the numbers and types of injuries reported have shown an increase in the occurrence of events, primarily events at fixed facilities, in the past four years as compared with the 1993-97 time period. This increase is primarily related to clandestine drug lab activity in Washington State. The average number of victims per **year** for 1998-2001 was 23% less than what occurred during the 1993-97 period. The average number of victims per **event** for 1998-2001 was 30% lower than during the 1993-97 period. It is encouraging that, even as the frequency of events has increased, the injury rate has declined.

## **HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE (HSEES)**

### **INTRODUCTION**

The surveillance system has four goals:

- To describe the distribution and characteristics of hazardous substances emergencies.
- To describe the morbidity and mortality experienced by employees, responders, and the general public as a result of hazardous substances releases.
- To identify risk factors associated with the morbidity and mortality.
- To identify strategies that might reduce future morbidity and mortality resulting from the release of hazardous substances.

This report summarizes the characteristics of hazardous substances releases and the associated public health consequences of events reported to the surveillance system during 1998-2001.

### **METHODS**

Releases are eligible for inclusion if they are uncontrolled or illegal and require removal, cleanup, or neutralization according to federal, state, or local law. Threatened releases are also included in the system if 1) they involve actions such as evacuations which are taken to protect the public health and 2) they would have required removal, cleanup, or neutralization according to federal, state, or local law. A substance is considered hazardous if it can be reasonably expected to cause injury or death to an exposed person. Releases occurring to air and water that could not be cleaned up are also included in the system if the amount released would have needed to be cleaned up if the spill had occurred on land. Events involving only petroleum products are excluded.

Various data sources were used to obtain information about these events. These sources included, but were not limited to, Federal Department of Transportation, Washington State Department of Ecology, Washington State Emergency Management, Washington State Department of Labor and Industries, Washington State Patrol, local fire departments, and local news media. Census data were used to estimate the number of residents living in the vicinity of the events. For each event, information was collected about the type of event (fixed-facility or transportation-related event); substance(s) released (identity, chemical form, type of release, and quantity released); victim(s) (population group, type of injury sustained, medical outcome, demographics, personnel protective equipment [PPE] worn, and distance from the event); the type of area in which the event occurred; date and time of occurrence; numbers of persons potentially affected; use of environmental sampling; evacuations; response plans; and causal factors.

Emergency events captured by HSEES are classified according to whether they occur at fixed facilities or during transportation. Fixed-facility events involve hazardous substances released at industrial sites, schools, farms, or other permanent facilities; transportation-related events involve hazardous materials released during transport by surface, air, or water.

Victims are defined as individuals with symptoms (including psychological stress) or injuries (including death) that result from the event. Victims who receive more than one type of injury are counted once in each applicable type of injury.

Substances are grouped into 11 categories: acids, ammonia, bases, chlorine, mixtures, paints and dyes, pesticides, polychlorinated biphenyls, volatile organic compounds (VOCs), other inorganic substances, and other substances. The “mixtures” category consists of chemicals from different categories that are mixed before release, and the “other” category consists of chemicals that cannot be classified into any one of the other 10 chemical categories. The category “other inorganic substances” comprises all inorganic substances except acids, bases, ammonia, and chlorine.

Prior to January 2000, data were computerized using a data entry system provided by ATSDR, and sent to ATSDR quarterly. Beginning in January 2000, data were entered into a Web-based data entry system. ATSDR performs data management, data analysis, and report generation of the entered data. ATSDR provides the Washington State Department of Health with its own state-level data for analysis and report generation purposes. HSEES data are then used for prevention activities by ATSDR and by the Washington State Department of Health.

## RESULTS

A total of 1,780 hazardous substances emergency events were reported in 1998-2001 to the HSEES system by the Washington State Department of Health; about 22 (1%) of these events were threatened releases. 1302 (73%) of the events occurred at fixed facilities, and 478 (27%) were transportation-related events (Table 1). Table 2 shows the number of events by county and type of event. King County had the highest frequency of events with a total of 541, followed by Pierce County with 151 events.

Fixed facilities events most frequently involved areas of storage above ground (17%), process vessels (10%), outdoor, non-farming non-industrial areas (10%), material handling areas (9%), or piping (9%). Figure 1 shows the distribution of fixed-facilities events by area.

In transportation-related events, 392 (82%) occurred during ground transport (for example, truck, van, or tractor), and 54 (11%) involved transport by rail (Figure 2). The remaining transportation-related events involved water, air, or pipeline transport.

Factors contributing to events were also reported (Figure 3). Equipment failure was a contributing factor in 536 (42%) of the events, human error was a factor in 394 (31%) of the events, deliberate damage or illegal activity contributed to 134 (11%) events, and the remainder were attributable to other factors. (Information on factors contributing to transportation events was not collected until 2000.)

91% of all events involved the release of only one substance. Two substances were released in approximately 4% of the events, and the remainder involved the release of more than two substances (Table 3).

Chemicals were either released or threatened to be released in the events. Actual releases accounted for 2135 (99%) of the substances, and 32 (1%) of the substances were threatened to be released. The number of substances released was higher than the number of events since more than one substance was released at some events. Most substances released were either spills (54%) or air emissions (25%). Of the spills, 64% occurred in fixed-facility events. Of the air emissions, 87% occurred in fixed-facility events. The remaining releases resulted from fires (16%) or other types (or combinations of types) of releases (4%).

Of the events with known time of occurrence, 38% occurred primarily from 6:00 AM to 12 noon, and 37% from 12 noon to 6:00 PM. Approximately 15% of events occurred on a Saturday or Sunday. The occurrence rate of events dropped by an average of about 26% during the months of November through February as compared with the rest of the year.

## **SUBSTANCES**

Of the 11 categories into which HSEES substances were grouped, the categories of substances most commonly released in fixed-facility events were other substances (23%), other inorganic substances (20%), volatile organic compounds (13%), acids (11%) and ammonia (10%) (Table 4). In transportation-related events, other substances (26%), volatile organic compounds (16%), other inorganic substances (15%), acids (13%) and bases (8%) were most frequently released. The 10 substances most frequently released in Washington for 1998-2001 are listed in Appendix A.

## **VICTIMS**

A total of 1653 victims were involved in 616 events (35% of all events) (Table 5). Of the events with victims, 351 (57%) involved only one victim. Fixed facilities events with one or more victims accounted for 520 (29%) of all events and transportation events with one or more victims accounted for 96 (5%) of the total.

The substances most frequently released may not necessarily be the most likely to result in victims (Table 6). For example, paints and dyes were released during 91 events; however, only 8 (9%) of these events resulted in adverse health effects. Conversely, chlorine was released in only 54 events, and 35 (65%) of these events resulted in adverse health effects, indicating its greater potential for immediate harm.

The population groups most often adversely affected were employees (68%) and the general public (17%)(Figure 4). There were 89 first responder victims in fixed-facility events. Of those, 47% were police officers, 41% were professional firefighters, 4% emergency medical technicians (EMTs), 4% hospital personnel, 2% company responders and 2% responders of unknown type (Figure 5). There were 34 first responder victims in transportation-related events.

Of these, 74% were police officers, 24% were professional firefighters and 3% were responders of unknown type.

The types of adverse health effects sustained by victims are shown in Table 7 and Figure 6. The victims sustained a total of 2743 adverse health effects, with many victims having more than one adverse health effect. The most commonly reported adverse health effects related to fixed-facility events were respiratory irritation (32%), eye irritation (13%), dizziness or other central nervous system symptom (12%), gastrointestinal problem (11%) and headache (10%). In transportation-related events, respiratory irritation (30%), eye irritation (14%), dizziness or other central nervous system symptom (13%) trauma (10%) and headache (9%) were reported most frequently. Trauma was reported more frequently in transportation-related events (10%) than in fixed-facility events (1%). The trauma might have been caused by the sequence of events (for example, a motor vehicle accident) leading to the release of a hazardous substance, and not necessarily by exposure to the hazardous substance itself.

The sex of 1534 (93%) of the victims was known; of these, 925 (60%) were male. Of the victims who were known to be male, 654 (71%) were employees, 131 (14%) were members of the general public, 92 (10%) were emergency responders and 48 (5%) were students. Female victims included 409 (67%) employees, 120 (20%) members of the general public, 67 (11%) students, and 13 (2%) emergency responders. The age of 1294 (78%) of the victims was known; of these, the mean age was 35 years (range: 0-95 years).

Level of treatment was used as a marker for injury severity (Figure 7). Over half of the victims [891 (54%)] were treated in hospital emergency rooms and released. Of the remainder, 314 (19%) were treated on the scene, 219 (13%) saw a private physician within 24 hours of the event, 90 (5%) were admitted to a hospital for treatment, 70 (4%) experienced injuries within 24 hours that were reported by an official, 41 (2%) were admitted to a hospital for observation only, and 28 individuals (<2%) died.

Among victims, 71% of employees, 60% of first responders, and 99% of students had not worn any form of PPE. For employee victims reported as wearing PPE, the most frequent protection used was gloves (24%), level "D" gear (24%), and eye protection (20%). Of the first responder victims, the most frequently worn PPE was firefighter turn-out gear (61%), and level "C" gear (21%).

Level "A" protection is worn when the highest level of respiratory, skin, and eye protection is needed. It includes a supplied-air respirator, approved by the Mine Safety and Health Administration (MSHA), U.S. Department of Labor, and the National Institute for Occupational Safety and Health (NIOSH); pressure-demand, self-contained breathing apparatus; fully encapsulating chemical-resistant suit; coveralls; long cotton underwear; chemical resistant gloves (inner); boots, chemical-resistant, steel toe and shank; hard hat; disposable gloves and boot covers; cooling unit; and 2-way radio communications. Level "D" is worn as a work uniform and is not recommended for sites with respiratory or skin hazards. Level "D" includes coveralls, gloves, boots/shoes (leather or chemical-resistant, steel toe and shank), safety glasses or chemical splash goggles, and hard hat. Level "D" provides no protection against chemical



hazards. Firefighter turnout gear is protective clothing normally worn by firefighters during structural fire-fighting operations, and is similar to level "D" protection.

Of the 28 persons who died as a result of hazardous substances releases, 13 were employees and 15 were members of the general public. Five of the victims were females, the remainder were males. Age was known for 26 of the victims. There was one child, age five, and 25 adults ranging in age from 22 to 67. Nine of the victims (35%) were ages 30 to 39, and seven (27%) were ages 20-29. An explosion at a petroleum refinery released hazardous chemicals into the atmosphere and caused the deaths of six men from smoke inhalation and thermal burns. Six trauma deaths were from accidents involving trucks carrying hazardous materials. One child and five adults died from carbon monoxide poisoning at private facilities. Four deaths were directly related to clandestine drug production.

November proved to be the deadliest month with four incidents accounting for a total of eleven deaths.

## **EVACUATION**

Evacuations were ordered in 356 (20%) events, and the evacuation status of 27 (2%) events was unknown. Of known evacuations, 256 (74%) were of a building or the affected part of a building, 86 (25%) were of an area besides an affected building, and 2 (<1%) were reported as having no criteria. The median number of persons evacuated was 20 (range: 1-8700), and the median length of evacuation was 2 hours (range: 1-168). In 19 events, in-place sheltering was ordered by an official, and instructions regarding precautions to take during in-place sheltering were provided by an official in 10 (53%) of these events.

## **CONTINGENCY PLANS**

The types of contingency or preparedness plans used during an event varied, with existing company procedures being used most frequently (54%). Fire department standard operating procedures were used about 42% of the time and in about 4% of the events an incident-specific plan was utilized.

## **METHAMPHETAMINE PRODUCTION**

In recent years, Washington State has seen a dramatic increase in clandestine drug lab activity. During 2001, there were a total of 91 methamphetamine-related events that met the criteria for inclusion in the HSEES dataset. Injuries were associated with 35 (38%) of these, with a total of 66 people being injured. Methamphetamine-related events occurred in nineteen counties in the state. Spokane County had the greatest number, accounting for nearly a quarter of all incidents. King and Pierce counties together accounted for over 27%. The remainder were scattered around the state with some counties reporting meth-related incidents for the first time.

Emergency responder injuries accounted for 25 (38%) of the 66 total injured during meth-lab related events. Nineteen of those injured were police officers, five were firefighters, and one was a responder of unknown type. The high rate of police officer injuries is related to the increasing likelihood of discovering meth labs during routine calls. For example, an officer

might open the trunk of a car during a routine traffic stop and be overcome by chemical fumes from a mobile meth lab. Responding to a domestic violence call may also result in the discovery of a meth lab. Police officers were most likely to experience respiratory irritation and/or dizziness or other central nervous system problems (such as lightheadedness, numbness, etc.). Firefighters were more likely to suffer from thermal burns and eye irritation.

Members of the general public accounted for 22 (33%) of those injured. Included were three children whose caretakers were either visiting or living in homes where there was a meth lab. The remaining 19 were meth “cookers” who were injured during fires or explosions of chemicals. Adults in this category were much more likely to experience chemical or thermal burns. Nausea was also reported frequently, often accompanied by eye irritation. Two of the children experienced respiratory irritation. The other child, a toddler, received chemical burns, eye, respiratory and skin irritation after direct exposure to a bucket of lye/toluene mixture.

Nineteen people (29%) who were injured were employees of businesses where meth labs were illegally set up (motels) or where meth chemicals were illegally dumped (refuse pickup and transfer facilities, liquid propane gas dealers). This number is probably low because some employees may neglect to report injuries for fear of losing their jobs. Respiratory irritation, nausea and headache were the most frequently reported injuries in this group.

Data from the years 1998 through 2001 was compared to evaluate geographical trends within the state. Events were distributed into three regions. Counties along the I-5 corridor (Clark, Cowlitz, King, Lewis, Pierce, Skagit, Snohomish, Thurston) accounted for 94% of all HSEES meth events in 1998 and virtually 100% of meth injuries. By 2001, the quantity of reported events had nearly tripled in this region. Counties in Eastern Washington (Benton, Chelan, Grant, Kittitas, Okanogan, Spokane, Whitman, Yakima) accounted for 5 to 10% of events during 1997 through 2000. In 2001 there was a very significant increase in meth events in Spokane County, accounting for most of the growth in the Eastern Washington region. Counties in Western Washington that are not part of the I-5 corridor (Clallam, Grays Harbor, Jefferson, Kitsap, Mason, Pacific) saw no activity in 1998, but gradually saw an increase until, by 2001, they accounted for over 10% of the total. There was a steady decline in the rate of injuries per event in the I-5 corridor counties over the four years. The remaining western counties had very high injury rates during 1999 and 2000, but showed a strong decline in 2001. Eastern Washington counties also showed a steep drop in their rate of injuries per event in 2001. This trend may be a result of increased training and experience of first responders in recognizing potential meth labs and their accompanying dangers.

## **USES OF HSEES DATA**

Washington State distributes reports on HSEES data to County Environmental Health agencies, County and State emergency planning committees, local law enforcement and fire protection agencies. Reports are posted on the Washington State Department of Health HSEES website and can be either read on-line or downloaded. Presentations of Washington’s HSEES data have been made at conferences including the Western Regional Epidemiology Network (WREN) Conference, the ISEA-ISEE Conference [International Society of Exposure Analysis

(ISEA), The International Society for Environmental Epidemiology (ISEE)], and the Washington State Public Health Association Joint Conference on Health.

## **SUMMARY OF RESULTS, 1993–2001**

The number of events, substances released, events with victims, and deaths for the years 1993 through 2001 are shown in Table 8. An increase in the number of events, particularly fixed-facility events, has been seen over the last three years. This increase is primarily related to clandestine drug lab activity in Washington State. The average number of victims per year for 1998-2001 was 23% less than what occurred during the 1993-97 period (413/year vs. 536/year). The average number of victims per event<sup>1</sup> for 1998-2001 (928) was 30% lower than during the 1993-97 period (1325). Figure 9 illustrates these trends.

Figure 8 shows the distribution of victims by category. The frequency of responder injuries has remained fairly stable throughout the 1998-2001 period (average 31, range 24-38). The average number of victims from the general public averaged 76 per year from 1998 through 2000. This rate declined during 2001 by over 40%. The widest variance occurred in student injuries (range 0-85). Student injuries in 2001 were very high primarily because of two events. The first event occurred when a release of fumes from a paper manufacturing facility affected an elementary school that was downwind. Fifty-two children experienced nausea, respiratory irritation and dizziness. The second incident involved the deliberate discharge of pepper spray in a high school. The fumes spread through the ventilation system, sickening 30 students.

It is encouraging that, even as the frequency of events has increased, the injury rate has declined. Since clandestine drug lab activity has driven much of the increase in hazardous substance emergency events, it is hoped that this trend might eventually reverse itself.

---

<sup>1</sup> Expressed as victims per 1000 events for ease of comparison.

## APPENDICES

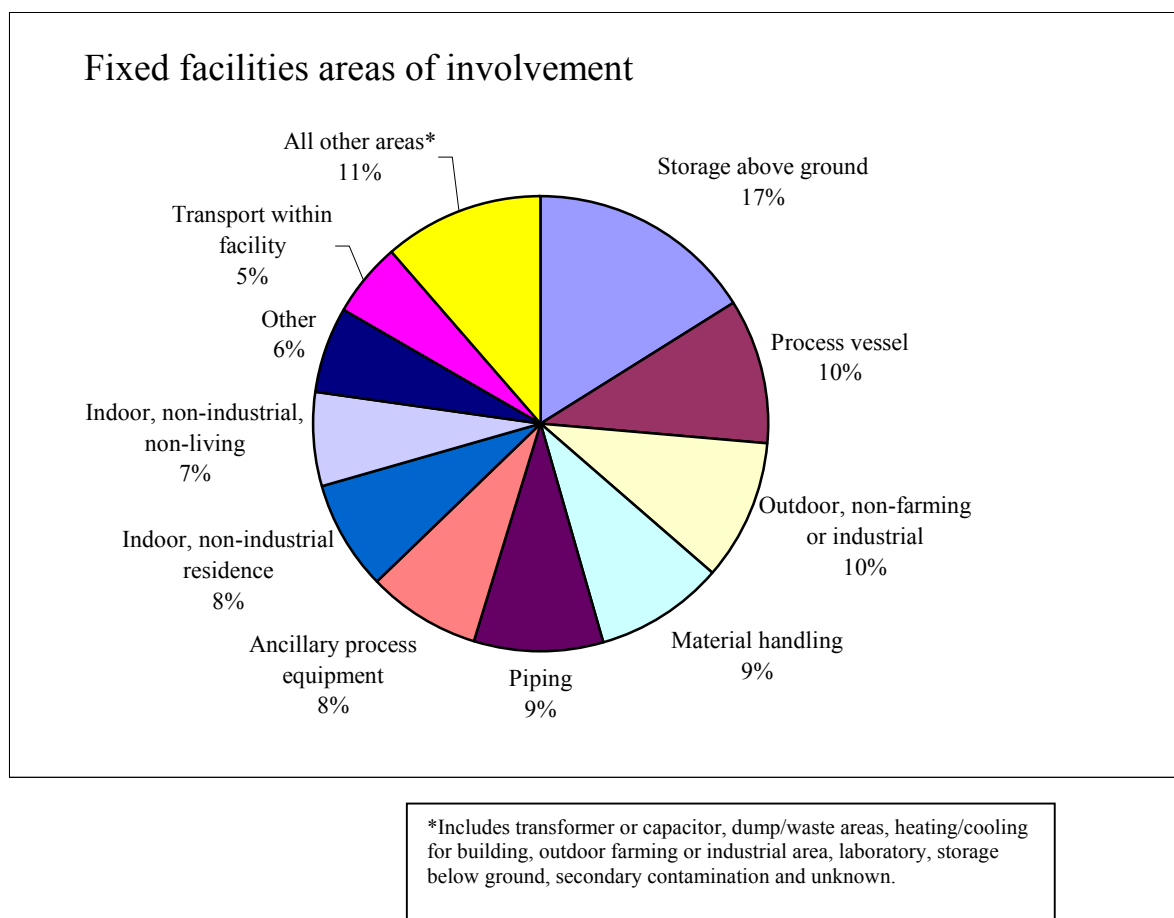
### **APPENDIX A** – The 10 Most Frequently Released Substances , Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.

Number	Standardized Substance Name	Frequency
1.	Ammonia	186
2.	Sulfuric Acid	80
3.	Solvent NOS	75
4.	Hydrochloric Acid	72
5.	Paint or Coating NOS	70
6.	Ethylene Glycol	61
7.	Sulfur Dioxide	58
8.	Chlorine	50
9.	Sodium Hydroxide	49
10.	Ephedrine	46
Total		747

**Table 1.**—Number of events meeting the surveillance definition, by year and type of event, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.

Year	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
1998	278	70	118	30	396
1999	317	75	106	25	423
2000	319	73	120	27	439
2001	388	74	134	26	522
Total	1302	73	478	27	1780

**Figure 1.**—Areas of fixed facilities involved in events, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.



**Figure 2.** —Distribution of transportation-related events, by type of transport, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.

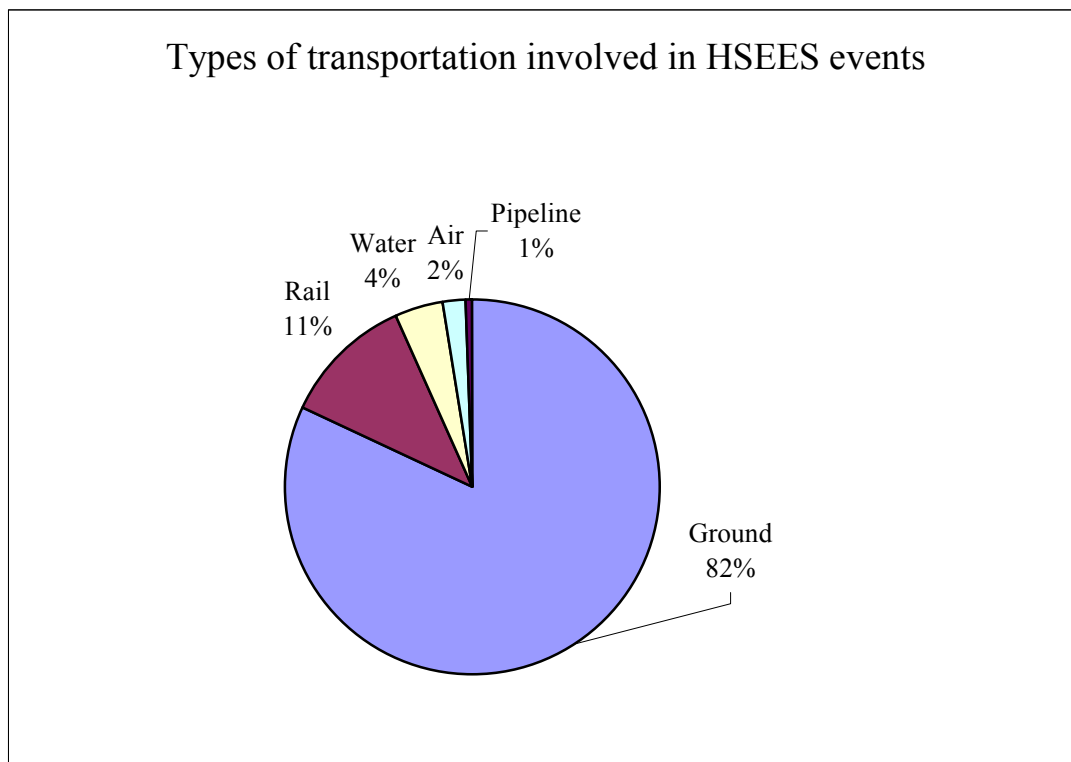
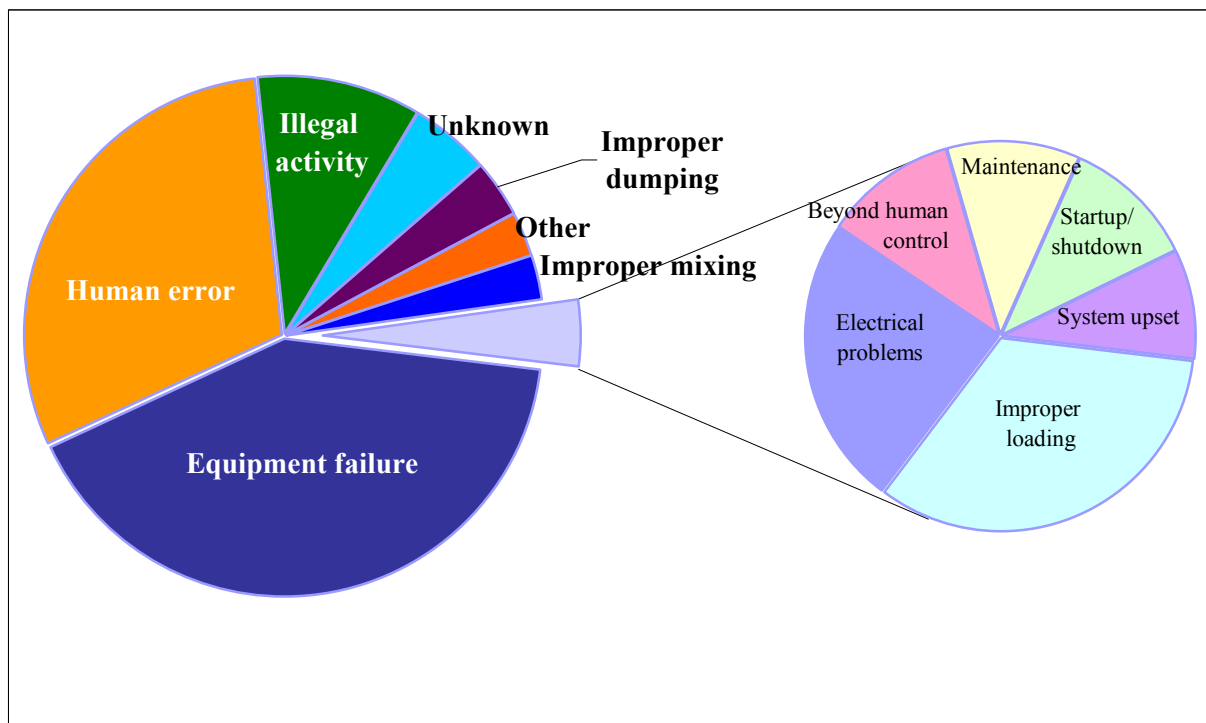


Figure 3. —Factors reported as contributing to the occurrence of fixed-facility events, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.



**Table 2.**—Number of events meeting the surveillance definition, by county and type of event, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
Adams	5	<1	6	1	11
Asotin	2	<1	0	0	2
Benton	99	8	18	4	117
Chelan	25	2	1	<1	26
Clallam	8	<1	0	0	8
Clark	75	6	16	3	91
Columbia	3	<1	3	1	6
Cowlitz	74	6	11	2	85
Douglas	6	<1	0	0	6
Franklin	17	1	13	3	30
Garfield	0	0	1	<1	1
Grant	27	2	10	2	37
Grays Harbor	22	2	16	3	38
Island	0	0	1	<1	1
Jefferson	6	<1	0	0	6
King	352	27	189	40	541
Kitsap	24	2	5	1	29
Kittitas	4	<1	3	1	7
Klickitat	3	<1	0	0	3
Lewis	16	1	3	1	19
Lincoln	3	<1	1	<1	4
Mason	3	<1	4	1	7
Okanogan	6	<1	2	<1	8
Pacific	4	<1	2	<1	6
Pend Oreille	2	<1	0	0	2
Pierce	107	8	44	9	151
San Juan	2	<1	0	0	2
Skagit	61	5	9	2	70
Skamania	3	<1	0	0	3
Snohomish	79	6	29	6	108
Spokane	98	8	38	8	136
Stevens	2	<1	5	1	7
Thurston	27	2	13	3	40
Wahkiakum	1	<1	1	<1	2
Walla Walla	9	<1	4	1	13
Whatcom	62	5	5	1	67
Whitman	9	<1	15	3	24
Yakima	56	4	10	2	66
Total	1302	100	478	100	1780



**Table 3.**—Distribution of the number of substances released, by type of event, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.

No. of substances released	Type of event						All events		
	Fixed facility			Transportation					
	No. events	%	No. of substances	No. events	%	No. of substances	No. events	%	No. of substances
1	1169	90%	1169	447	94%	447	1616	91%	1616
2	60	5%	120	16	3%	32	76	4%	152
3	37	3%	111	9	2%	27	46	3%	138
4	21	2%	84	3	<1%	12	24	1%	96
≥ 5	15	1%	150	3	<1%	15	18	1%	165
Total	1302	100%*	1632	478	100%	533	1780	100%	2165

\* Percentage totals may not add up to 100% because of rounding.

**Table 4.**—Distribution of the number of substances released, by substance category and type of event, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.

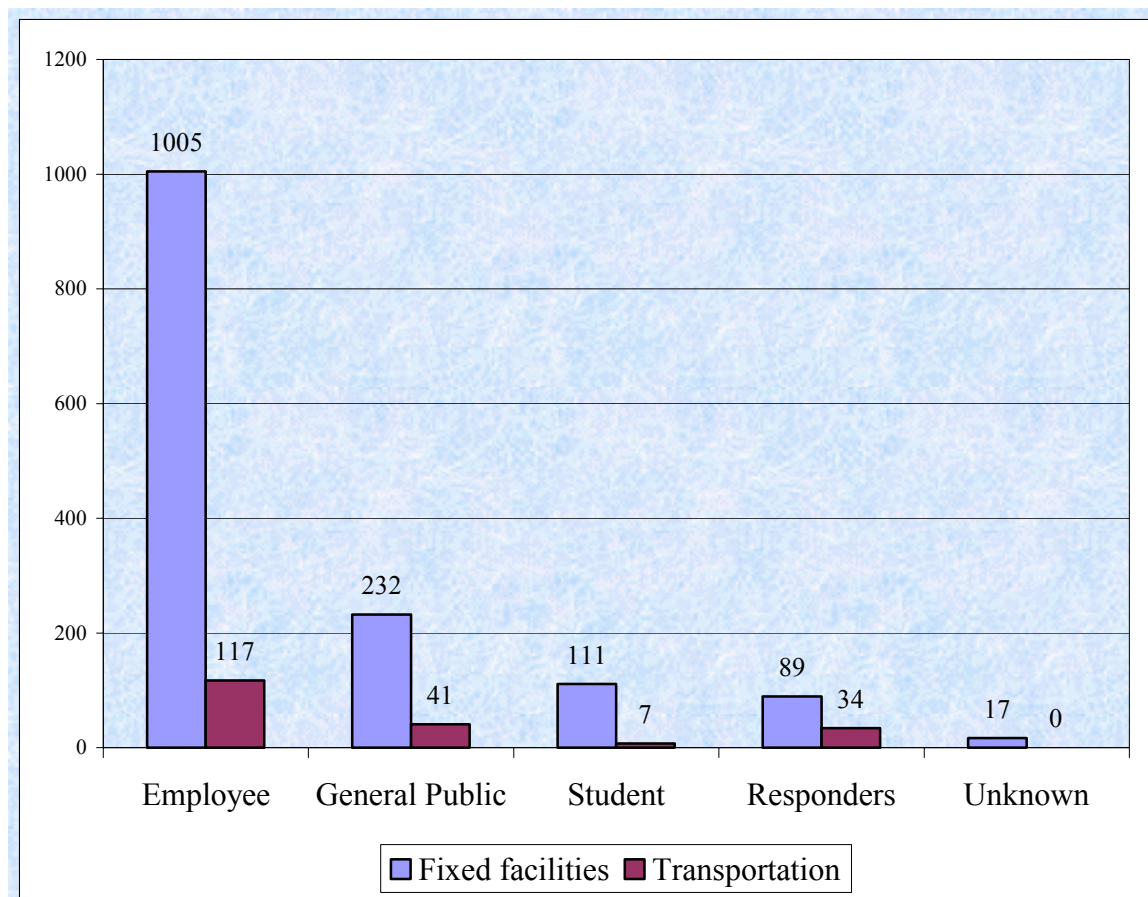
Substance category	Type of event		All events
	Fixed facility	Transportation	
	No. of substances (%)	No. of substances (%)	No. of substances (%)
Acids	174 (11%)	69 (13%)	243 (11%)
Ammonia	163 (10%)	34 (6%)	197 (9%)
Bases	37 (2%)	42 (8%)	79 (4%)
Chlorine	52 (3%)	2 (<1%)	54 (2%)
Mixtures*	112 (7%)	31 (6%)	143 (7%)
Other inorganic substances	324 (20%)	81 (15%)	405 (19%)
Other substances	381 (23%)	138 (26%)	519 (24%)
Paints and dyes	68 (4%)	23 (4%)	91 (4%)
Pesticides	79 (5%)	27 (5%)	106 (5%)
Polychlorinated biphenyls	30 (2%)	1 (<1%)	31 (1%)
Volatile organic compounds	210 (13%)	84 (16%)	294 (14%)
Total	1630	532	2162

\* Mixtures of substances from different categories.

**Table 5.**—Distribution of the number of victims, by type of event, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.

Number of Victims	Type of events				All events	
	Fixed facility		Transportation			
	Events (%)	Victims	Events (%)	Victims	Events (%)	Victims
1	288 (55%)	288	63 (66%)	63	351 (57%)	351
2	96 (18%)	192	14 (15%)	28	110 (18%)	220
3	42 (8%)	126	7 (7%)	21	49 (8%)	147
4	25 (5%)	100	3 (3%)	12	28 (5%)	112
5	16 (3%)	80	4 (4%)	20	20 (3%)	100
≥6	53 (10%)	668	5 (5%)	55	58 (9%)	723
Total	520	1454	96	199	616	1653

**Figure 4.**—Distribution of victims by population group and type of event, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.



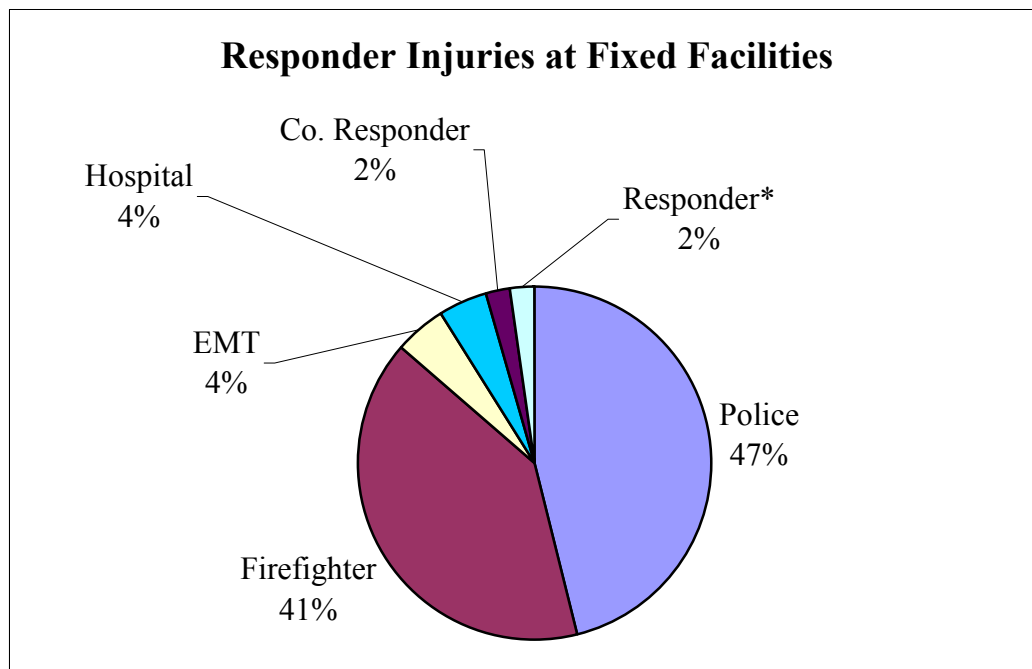
**Table 6.**—Number of substances released in all events and events with victims, by substance category, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.

Substance category	Total releases		Releases with victims		
	No.	Percent of total releases	No.	Percent of all releases with victims	Percentage of releases in substance category
Acids	243	11	111	15	46
Ammonia	197	9	79	10	40
Bases	79	4	19	3	24
Chlorine	54	2	35	5	65
Mixtures	143	7	63	8	44
Other inorganic substances	405	19	132	17	33
Other, not otherwise specified	519	24	179	24	34
Paints and dyes	91	4	8	1	9
Pesticides	106	5	36	5	34
Polychlorinated biphenyls	31	1	0	0	0
Volatile organic compounds	294	14	96	13	33
Total*	2162	100	758	100	35

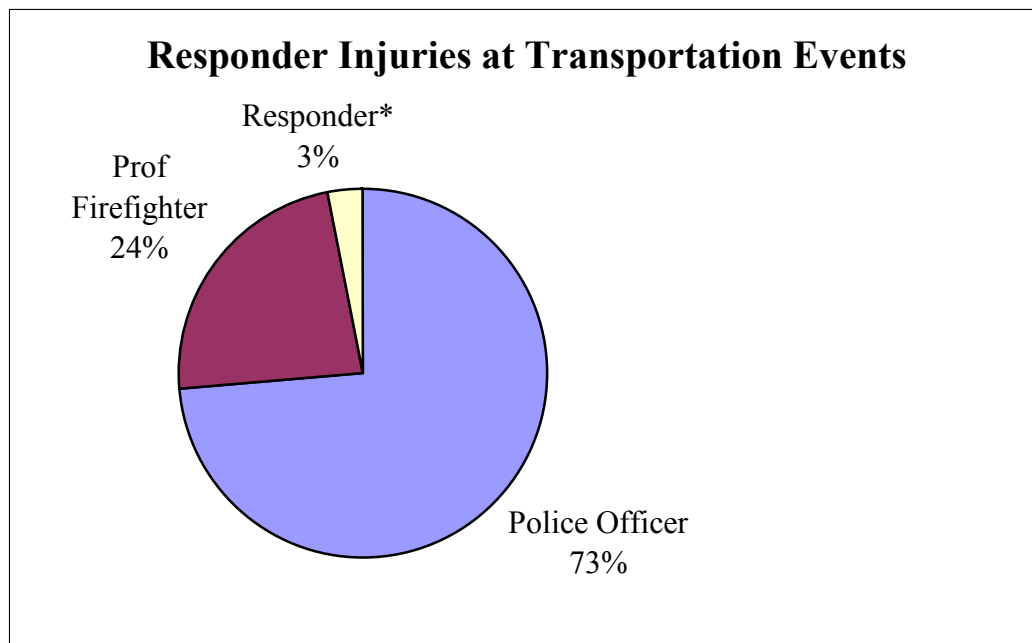
\*Total exceeds total number of events because events at which more than one substance was released were counted more than once.

**Figure 5.**—Distribution of responder victims†, by population group and type of event, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.

† There were 123 responder victims reported to Washington State in 1998-2001.

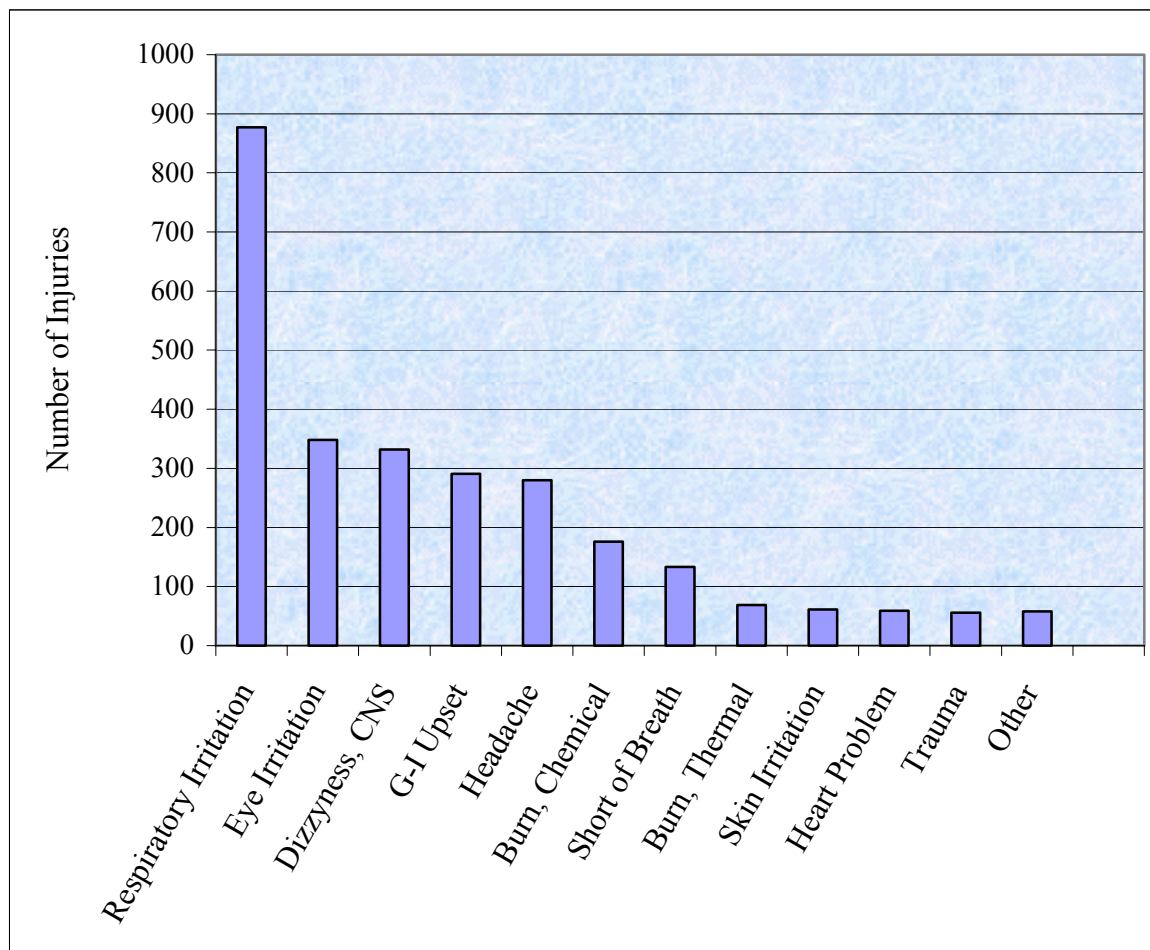


\* Responder type unknown.

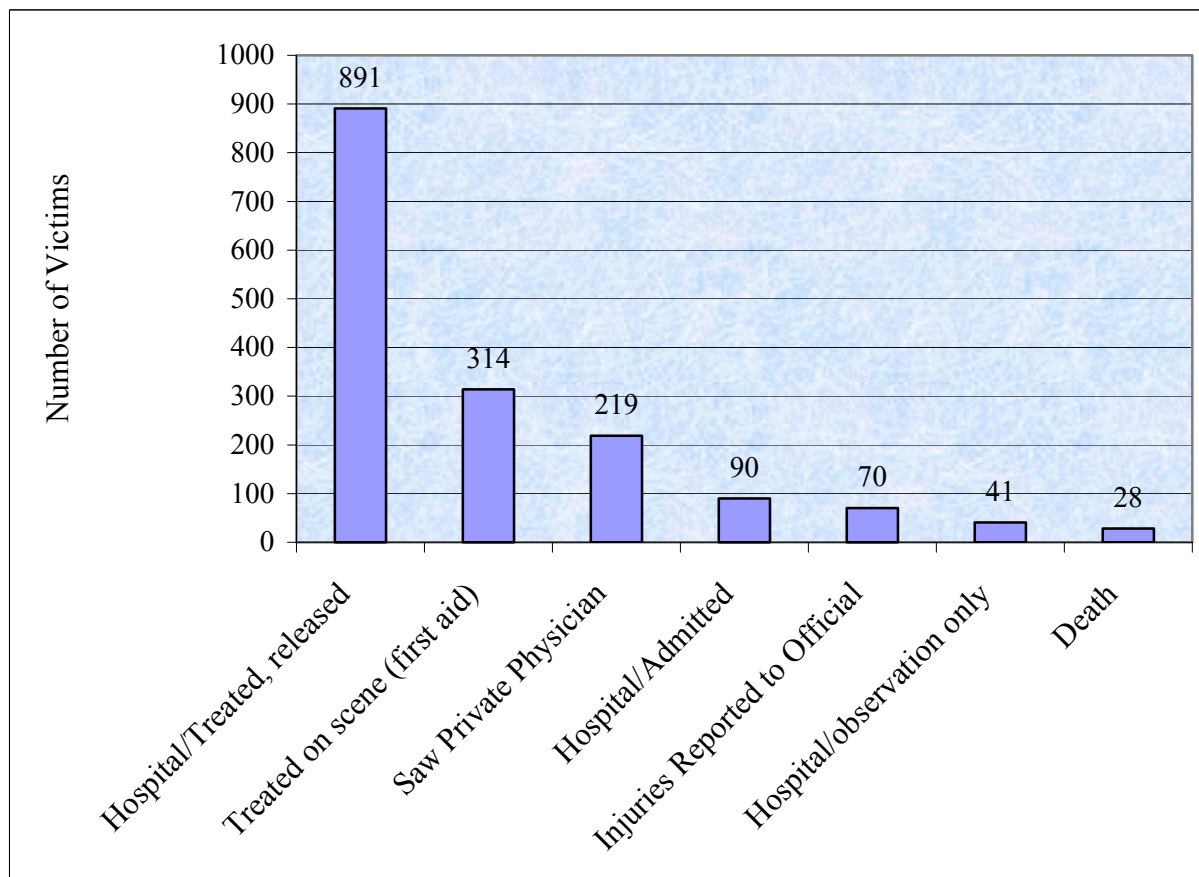


\* Responder type unknown.

**Figure 6.** —Distribution of type of injury for all events, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.



**Figure 7.** —Injury outcome, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.



**Table 7.**— Distribution of type of adverse health effect, by type of event,\* Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.

Type of adverse health effect	Type of events				All events	
	Fixed facility		Transportation			
	No.	%	No.	%	No.	%
Chemical burns	151	6	25	8	176	6
Heart problems	55	2	4	1	59	2
Dizziness/CNS <sup>†</sup>	291	12	41	13	332	12
Eye irritation	306	13	42	14	348	13
Headache	254	10	29	9	283	10
Heat stress	2	<1	1	<1	3	<1
Gastrointestinal problems	274	11	17	6	291	11
Respiratory problems	786	32	91	30	877	32
Shortness of breath	122	5	11	4	133	5
Skin irritation	54	2	7	2	61	2
Thermal burns	67	3	2	<1	69	3
Trauma	27	1	29	9	56	2
Other	47	2	8	3	55	2
Total	2436	100	307	100	2743	100

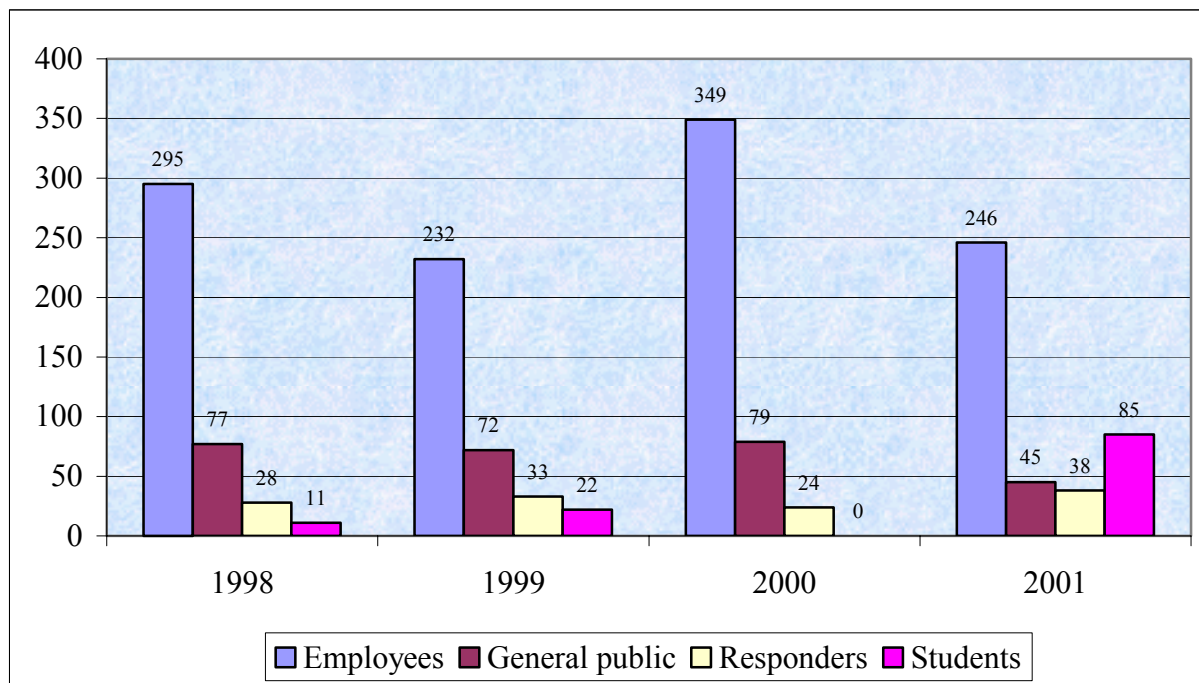
\* The number of injuries is greater than the number of victims, because a victim could have had more than one injury.

<sup>†</sup> Central nervous system symptoms.

**Table 8.**—Cumulative data, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.\*

Year	Type of event			No. of substances released	No. of deaths	No. of victims	Events with victims	
	Fixed facility	Transport	Total				No.	%
1993	385	82	467	518	4	608	125	27%
1994	270	115	385	430	3	371	82	21%
1995	319	100	419	477	5	500	93	22%
1996	277	105	382	476	1	582	87	23%
1997	258	111	369	515	2	620	75	20%
1998	278	118	396	455	16	411	100	25%
1999	317	106	423	576	3	359	168	40%
2000	319	120	439	492	6	468	180	41%
2001	388	134	522	644	3	415	168	32%
Total	2811	991	3802	4583	43	4334	1078	28%

**Figure 8.**—Distribution of victims, Hazardous Substances Emergency Events Surveillance, Washington State, 1998-2001.



**Figure 9.** —Cumulative data for Washington State, Hazardous Substances Emergency Events Surveillance, 1993-2001.

